U.S. PATENT APPLICATION

FOR

A FLEXIBLE MARKER DEVICE

BY

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CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Patent Application 10/131,316 filed on 04/23/2002 and is cross-referenced to and claims priority from U.S. Patent Application 10/131,316 filed on 4/23/2002, U.S. Provisional Application 60/442,355 filed on 01/23/2003 and PCT Application US03/02116 filed on 01/23/2003, which are all hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates generally to traffic marker devices and safety cones that are used to alert or divert vehicles, watercrafts, aircrafts and pedestrians to pass safely around

hazards, obstacles or other areas. More particularly, the present invention relates to a flexible safety marker device with a fast impulse response to direct (contact) and indirect (no-contact) perturbations and large flexibility.

BACKGROUND

Traffic or safety cones, are routinely used to direct motorists and pedestrians away from obstacles or dangerous area. These cones are usually brightly colored, hollow conical shaped devices made of a synthetic, rubber or other plastic (See for example Patent No. 2,333,273 to Scanlon et al.). Traffic and safety cones are meant to minimize damage to persons or vehicles which may collide with the cones. However, safety cones are still of significant danger to the public. One reason is that, although the traffic cones are made out of a synthetic, rubber or other plastic, they are still relatively rigid and tend to fall over easily when the cones are subject to natural or traffic wind, perturbations by passing traffic or violence. Furthermore, safety cones that are, for instance, run over or hit by a vehicle, could become dangerous objects or obstacles by being airborne or simply laying on the road, in particular to following traffic or surrounding people.

A variety of different self-righting traffic cones have been proposed. For instance, Patent No. 3,386,409 to Dietz Company describes to shape the base of the cone in such a manner that the cone is nestable or stackable self-righting in the manner of a self-righting top. The objective of Patent No. 3,386,409 is to provide a nestable cone which, when it has been toppled over, will not roll away but will right itself and stand erect near to the position in which it was

originally placed. This was accomplished by a hollow molded plastic traffic cone that has a base portion weighted to give a low center of gravity to the cone. The annular bottom of the base is gradually curved outward and upward to provide rockers so the cone is self-righting and is divided into six angularly spaced triangular legs to prevent rolling when the cone is knocked over.

Patent No. 5,888,016 to Eui Sig Ahn et al. describes a traffic collar cone that has a delineator having a reflection sheet attached on its upper part. A plug is placed under the sheet having an air inlet and outlet extending upwardly and downwardly there-through. A conical body member is provided, having in its upper end wall an insertion hole in which the plug is mounted. A support panel is provided at the bottom of the body and cone collars are attached on the outer surface of the body member, with vertical spacing between them. The traffic collar cone is made of flexible material and designed to recover its original shape after being impacted, so that injury to collar cone is eliminated or minimized.

Patent No. 5,993,105 to Chan describes a safety marker that includes a hollow frusto-conical body and a base having a bowl-shaped main portion and a resiliently flexible skirt for yieldably stabilizing the marker against tipping relative to a supportive surface.

So far the solutions have focused on self-righting of the traffic cone. However, these solutions are still not satisfactory from a safety standpoint since they still are either too rigid

or can still relatively easy fall over. Accordingly, there is a need to develop a better traffic cone or marker device that further improves road and traffic safety.

SUMMARY OF THE INVENTION

The present invention provides a new marker device for increased safety due to a flexible design. The marker device of the present invention includes a base with an opening and a flexible means that is positioned over the base. The bottom part of the flexible means is attached to the base. The flexible means has a fast impulse response to direct (contact) and indirect (no-contact) perturbations. Due to the perturbations one or more parts of the flexible means might undergo different degrees of deflection from their original (vertical) position. In general, depending on the type of perturbation (direction of force applied and amount of force applied), one or more parts of the flexible means should be able to allow deflections ranging up to about 180 degrees which is defined from the original (vertical) position. In one example the range of deflection is from about 15 degrees up to about 180 degrees. In case the flexible means is a coil the design of the coil is restricted to the number of loops of the coil in such a manner that during these large deflections the loops maintain spaced from each other; i.e. the loops should for instance not be touching or locking into each other since this would risk that the coil could not restore from the perturbation back to its original position. In addition, touching or intertwined loops might increase the stiffness of the coil during deflections and work against the fast impulse response of the flexible means.

In one embodiment, one or more of the bottom loops of the coil should have a larger diameter than the diameter of the opening of the base. The reason for this is that these bottom loops could get stuck with the base which would jeopardize the restoration of the flexible means from a perturbation.

The marker device of the present invention includes a cover, preferably a mesh-cover, to cover the flexible means. The outside of the cover could include one or more bands of reflective material. In addition, the present invention could include one or more light sources to illuminate the marker device. The light source(s) could be placed inside and/or outside the cover and/or attached to the flexible means and/or the base.

The advantage of the present invention over previous devices is that the present marker device quickly responds and deflects, with one or more parts of the flexible means capable of deflecting up to about 180 degrees from their original position, to direct (contact) and indirect (no-contact) perturbations. The marker device increases the likelihood for the marker device to remain upright once the perturbations disappear, therewith increasing the likelihood for the marker device to remain serving as a marker device safely alerting traffic; i.e. its intended purpose.

BRIEF DESCRIPTION OF THE FIGURES

The objectives and advantages of the present invention will be understood by reading the following detailed description in conjunction with the drawings, in which:

FIG. 1 shows an exemplary embodiment of a marker device according to the present invention;

FIG. 2 shows an example of a top view of a marker device according to the present invention;

FIGS. 3-5 show exemplary embodiments of the flexibility and degree of bending/deflection of parts of the flexible means of a marker device due to a perturbation according to the present invention;

FIG. 6 shows an example of the degree of flexibility of the marker device when a marker device is hit and run over by a car according to the present invention;

FIG. 7 shows an example of a light source inside of a marker device according to the present invention;

FIG. 8 shows an example of a marker device with one rod as flexible means according to the present invention;

FIG. 9 shows an example of a position of the marker device shown in **FIG. 8** due to a perturbation according to the present invention;

FIG. 10 shows an example of a marker device with three rods as flexible means according to the present invention;

FIG. 11 shows an example of a position of the marker device shown in **FIG. 10** due to a perturbation according to the present invention;

FIG. 12 shows a cross section view of an exemplary marker device assembly according to the present invention;

FIG. 13 shows an example of a rod with a spring to enhance the flexibility of the rod, i.e. flexible means, according to the present invention; and

FIG. 14 shows an example of a marker device with two or more flexible means according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Although the following detailed description contains many specifics for the purposes of illustration, anyone of ordinary skill in the art will readily appreciate that many variations and alterations to the following exemplary details are within the scope of the invention. Accordingly, the following preferred embodiment of the invention is set forth without any loss of generality to, and without imposing limitations upon, the claimed invention.

The marker device of the present invention could be used to alert or divert vehicles, watercrafts, aircrafts and pedestrians to pass safely around hazards, obstacles or other areas. However, the marker device of the present invention is not limited to any particular use and could also be used for recreational or sporting events. Furthermore, the marker device is usually recognized as a cone and is therefore called safety cone. However, the marker device of the present invention is not limited to any particular shape and could also be straight, curved, circular, cylindrical, square, a hexagonal, a tubular marker, any three-dimensional shape type, or any type of shape that is needed or required to alert or divert someone, or mark-off a particular space or area. Therefore, the device of the present invention is referred

to as a marker device. Furthermore, there is also no restriction to the size of the particular marker device or safety cone of the present invention.

FIGS. 1-2 show an exemplary embodiment of a marker device **100** according to the present invention. Marker device **100** includes a base **110** with an opening **112** and a cone **120**. Opening **112** is preferred to allow stacking of marker devices. The bottom part **142** of flexible means **140** is attached to base **110**, preferably centered over base **110**, and close to the edge **210** of opening **112**, either at the inside of opening **200** or at the top of base **110**. Base **100** provides the support of marker device **100** and keeps the marker device on the ground or surface. Base **110** is shown as a square with round edges **112**. However, base **110** could take any type of shape and could also be made out of any material as long as it provides the required support. The base of the marker device plays an important role in the stability of the marker device. The weight of the base should be significantly larger than the combined weight of all the components that are positioned above the base (see description *infra*). Furthermore, the dimensions of the base should be large enough to support, in a stable fashion, the entire marker device with or without perturbations. The measurement (length and width) of base **110** could be, but is not limited to, about 14" by about 14", which is the standard base size for conventional safety cones in the U.S.A. (e.g. 18" and 28" high cones). The materials that could be used for the base are, for instance, but not limited to, rubber, recyclable rubber, soft/hard plastic, PVC, any type of wood including bamboo or wood compositions, metal, or the like.

Cone **120** includes a flexible lightweight cover **130** that covers a flexible means **140**. Preferably, cover **130** is made out of a flexible material that allows cone **120** to easily flex, bend or fold. Cover **130** should not resist or minimal resist the movement of flexible means **140**. The top **132** and bottom **134** of cover **130** could be attached to flexible means **140**. Instead of attaching bottom **134** of cover **130** to flexible means **140**, bottom **134** could be attached to base **110**. The type of means for connecting cover **130** is, for instance, but not limited to, stitches, clamp(s), glue, Velcro, a ring (See **FIG. 13**) or the like. However, cover **130** could also fit tight over flexible means **140** and in this case there is no need for a connecting means to connect cover **130**.

In a preferred embodiment, the cover should have air-passing capabilities, e.g. by having a mesh cover, to make it less wind resistant. Examples of cover materials are for instance, but not limited to, a mesh-type material, vinyl, canvas, polyester, or the like. Furthermore, the outside of the cover could include all kinds of shapes and/or reflective material. Preferred shapes (reflective collar(s), stripes, or other types of regulatory shapes or signs) are the ones recommended by the Government (Federal, State/Province or Local; e.g. the U.S. Department of Transportation including the FAA and/or the Federal Highway Administration) and include common traffic control or warning signs. **FIG. 1** shows an example of a cone **100** with a cover **130**. Cover **130** includes two bands of reflective material that are positioned at two distinct positions on cover **130** according to U.S. Government regulations. **FIG. 1** shows the first reflective band (shaded) positioned at about 3" (inches) from the top of cover **130** and this first band is about 6" (inches) in height. **FIG. 1** shows the second reflective band

(shaded) positioned at about 2" (inches) from the bottom of the first reflective band and this second band is about 4" (inches) in height. Any other type of shape or sign can be included and is depended on the type of application. It is possible to use a reflective material that can be attached/assembled to the cover using heat, glue, tape, Velcro, sewing or the like. An example of a suitable reflective material is the 3M 8710 reflective material (from the 3M Corp.; See U.S. Patent No. 6,656,319 to 3M Innovative Properties Company, which is hereby included by reference for all that it discloses) that also has the benefit of about 500 candlelight power. The present invention is not limited to 3M 8710 reflective material or to a reflective material with about 500 candlelight power, since any type of reflective material could be used each with a different amount of reflective intensity (higher or lower), (see e. g. Reflecto-Lite Inc.).

Flexible means **140** is, for instance, a coil that is shaped as a cone when marker device **100** is meant to be a safety cone. Flexible means **140** provides for the flexibility of marker device **100**. The key idea of the present invention is that the base provides stable support on the ground or surface, and the flexible means is in either its original position or a deviated position from the original position caused by indirect (non-contact) or direct (contact) perturbations. Examples of indirect (non-contact) perturbations are, for example, but not limiting to, perturbations caused by natural wind, traffic wind, ground-shaking caused by earthquakes, falling or being dropped on the ground (see also description *infra*), or the like. Examples of direct (contact) perturbations are, for example, but not limiting to, perturbations from vehicles by hitting, running over or running into the marker device, violence, or the like.

The applied (direct and/or indirect) perturbation force (**F**) applied at the flexible means for a period of time is an impulse, which is the act of applying force suddenly (See e.g. Webster Dictionary). The mechanical definition of impulse is the action of a force during a very small time interval (See e.g. Webster Dictionary and Oxford Dictionary of Physics). To sustain, without the marker device permanently fallen over, direct and indirect perturbations, the material properties of the flexible means of the present invention require a fast impulse response to these direct and indirect perturbations; i.e. the flexible means needs to respond fast by flexing, bending and/or folding to any direction in response to the suddenly applied (indirect and/or direct) force as shown in **FIGS. 3-6** and could, for instance, bend sideways, downward or even flex/extend upward. In other words, flexible means deviates from its original position (i.e. natural or neutral position in case flexible means is a coil or a spring). The direction and amount of deviation from the original position depends on the amount and direction of the perturbation force. Once the perturbation force is removed or disappears, flexible means restores from the deviated position to its original position.

As shown in **FIG. 3-6** the degree of flexibility or deflection (α) from original (vertical) position of the flexible means is significant. Due to the perturbations different parts of the flexible means undergo different degrees of deflection from their original (vertical) position. For example, parts **310**, **320**, **330** as shown in **FIG. 3,** show a deflection of about 11 degrees, about 31 degrees, about 100 degrees (indicated by lines **312**, **322**, **332**), respectively. In another example, part **410**, **420**, **430** shown in **FIG. 4**, show a deflection of about 21 degrees,

about 90 degrees, about 170 degrees (indicated by lines **412, 422, 432)**, respectively. A deflection of up about 180 degrees for instance could require a perturbation whereby the top of the cone is brought downward to the direction of the ground or base.

FIG. 5 shows an example of marker device **500** now including a cover over the flexible means subject to a perturbation force **510** that makes flexible means to quickly flex, bend or fold away from its original (upright) position with deflections **530, 540, 550, 560** of different parts of the cone (flexible means and cover). In this example part **530, 540, 550, 560** have a deflection of about 2 degrees, about 12 degrees, about 26 degrees, about 52 degrees, respectively.

In general, depending on the type of perturbation (direction of force applied and amount of force applied), one or more parts of the flexible means should be able to allow deflections of up to about 180 degrees which is defined from the original (vertical) position. In one example the range of deflection is from about 15 degrees up to about 180 degrees. In case the flexible means is a coil the design of the coil is restricted to the number of loops of the coil in such a manner that during these large deflections the loops maintain spaced from each other; i.e. the loops should for instance not be touching or locking into each other since this would risk that the coil could not restore from the perturbation back to its original position. In addition, touching or intertwined loops might increase the stiffness of the coil during deflections and work against the fast impulse response. In general, depending on the height of the marker device between 2-10 loops could be used; i.e. the number of loops spaced between the base

and the top of the cone leaving a large space **144** between the loops. Examples of a type of material for the flexible means are, for example, but not limited to, a metal (e.g. aluminum, steel, etc.), a carbon, a graphite, a wood (including bamboo), a fiberglass, a plastic, a rubber or the like.

In one embodiment, in particular for the case that the flexible means is a coil, it is also important that during the perturbations the coil does pop through opening **112**. For instance, if the largest diameter of the loops of the coil is the same as or less than the diameter of the opening, then during perturbations (e.g. bending of the coil or pressing the coil downwards) the coil could pop through the opening and one of the bottom loops could get stuck with or under the base. This would be a concern since the coil can then no longer properly restore from the perturbed position back to its original position. To prevent this from happening, the coil in this embodiment would then require that at least one of the bottom loops, e.g. loop **146** of coil **140** has a larger diameter than the diameter of the opening (see top view of **FIG. 2** where different in diameter is shown). In one exemplary embodiment, opening could have a diameter of about 10" and the diameter of at least one of the bottom loop(s) is about 12.5". The present invention is not limited to the number of loops with larger diameters than opening or any particular dimensions. In an alternative embodiment a small recess at the edge of the opening (not shown) could be created, still leaving a large enough opening for stacking with another marker device, to provide support to the coil and prevent it from popping through.

FIG. 6 shows a situation where a moving car **600** runs into and over a marker device of the present invention, i.e. a direct (contact) perturbation force. When car **600** hits marker device **610** with bumper **620** (i.e. a high speed impact), base **630** remains on the ground and only the flexible means and cover bend as indicated by **640**. In the example of **640**, the impact of the car with the flexible means causes the original position of the flexible means (see e.g. **FIG. 1**) to quickly change to deviated position **640** with large deflections of different part of the cone (flexible means and cover). To sustain such an impact, the flexible means requires a fast impulse response. When marker device **650** is under the car, base **630** could rock but does not permanently tip over mainly due to its weight and the flexible means responding to the impact and perturbation. The flexible means and therewith the cone also quickly re-positions itself to the original (upright) position when the car is no longer on top of the marker device as indicated by **670**. During the perturbation, the base of the marker device of the present invention might undergo some rocking motion(s), however, once the perturbation disappears the base of the marker device will return to its original and stable position.

Another example (not shown) is that the marker device of the present invention could be dropped down to the ground (which results in an indirect perturbation to the flexible means, through a direct impact to the base), for instance, but not limited to, from a car or a truck that is delivering several marker devices to an area to, for instance, block an obstacle. The impact of the landing of the marker device on the ground causes sudden and fast perturbations to the flexible means. After landing on the ground, the marker device of the present invention might

initially rock but will come to their original and stable position once the rocking motions oscillate out.

The likelihood that the marker device of the present invention remains in that position is facilitated by a very low center of gravity (close to the ground or supporting surface) of the marker device. The low center of gravity is mainly due to a relatively heavier base compared to the combined weight of the flexible means and cover that over positioned over the base (flexible means and cover are preferably made of lightweight material(s)). The center of gravity of the marker device could virtually be close to the top of the base or somewhere in the base in case the difference between the weight of the base and combined weight of the flexible means and cover that are positioned over the base is large as a person of average skill would readily appreciate. Furthermore, the fact that the flexible means (and cover) bends at different spots, with the loops maintaining space between each other (i.e. without loops touching each other or locking into each other), significantly reduces the torque that the perturbed flexible means produces onto the base (this in contrast to existing traffic safety cones or marker devices which have a relatively stiff top/cone part or where coil loops are restricting even small deflections such as less than about 10 degrees). The reduced torque improves the stability of the base and therewith the stability of the marker device of the present invention.

The marker device of the present invention could include one or more light sources such as light source **710** shown in marker device **700** in **FIG. 7**. Light source **710** could be positioned

anywhere inside cover **720** to illuminate the inside of cover **720**. However, light source **710** could also be positioned to the base or flexible means. In case a light source is included inside cover **710**, it would be preferred that the material of the cover is transparent to light so that the marker device becomes visible in the dark or in situations of poor visibility. Light source **710** could be any type of light source and is not limited to a particular type or mechanism. Light source **710** is preferably lightweight and small. Light source **710** could be positioned by or near opening **200** of base **110**, but could also be positioned near the top **730** of the flexible means **740**. In general, the light source(s) could be placed at the base, flexible means or cover (inside or outside). The marker device of the present invention could also have a sensor to turn on the light source. The sensor could, for instance, be positioned at the bottom of the base. Once the marker device is placed on the ground or surface, the sensor turns on the light source and the marker device becomes lit. The sensor could, for instance, be a mechanical switch. However, the sensor is not limited to a mechanical switch since it could also be a light-sensitive sensor that turns on the light source depending on whether it is, for instance, daytime or nighttime. In addition, the sensitivity of the sensor can also be set so that it will be turned on when the visibility becomes less.

The present invention has now been described in accordance with several exemplary embodiments, which are intended to be illustrative in all aspects, rather than restrictive. Thus, the present invention is capable of many variations in detailed implementation, which may be derived from the description contained herein by a person of ordinary skill in the art. For instance, in order to meet the stated (explicit or implied) objectives and advantages of the

present invention, the marker device and its components could be designed, manufactured and assembled in a variety of different ways with a variety of compatible different of materials and dimensions. The discussion *infra* provides some examples of the different materials, dimensions as well as possible assemblies and variations.

Generally speaking, the height of the marker device of the present invention is not restricted. However, the art as well as Government (Federal, State/Province or Local) regulations teach several specific dimensions/heights for safety traffic cones. Examples of such dimensions in the U.S.A. are, for instance, but not limited to, a 14-inch high cone, 18-inch high cone, 28-inch high cone or a 36-inch high cone. As a person of average skill in the art would readily appreciate, the height of the marker device is mostly dependent on the type of use or application as well as on any type of Government regulations or requirements (Federal, State/Province or Local), which (may) vary in different countries/parts around the World.

The flexible means could also include one or more rods as long as the physical characteristics of the rod(s) meet the objectives and advantages of the present invention as they are discussed *supra*; i.e. the rods have a fast impulse response to direct and indirect perturbations. This includes the need to allow for large deflections of one or more parts of the rod(s) as described *supra*. **FIG. 8** shows an example of a safety cone **800** in which the flexible means is based on one rod **810** that is positioned over base **820**. Rod **810** could, for example, be attached with its bottom end to base **820** and with its top end to the top of cover **830** (e.g. a ring). The cone shape of exemplary safety cones as it is discussed *supra*, is defined and determined

predominantly by the flexible means. However, in case of marker device **800**, the cone shape has to be determined by cover **830** that is placed over rod **810**. **FIG. 9** shows safety cone **800** subject to a perturbation **900**, whereby rod **810** is bend due to perturbation **900**. **FIG. 10** shows examples of a safety cone **1000** in which the flexible means is based on three rods **1010**, **1020**, and **1030** that are positioned over base **1040**. Rods **1010**, **1020**, and **1030** could, for example, be attached with their bottom ends to base **1040** and with their top ends to the top of cover **1050** (e.g. a ring). **FIG. 11** shows safety cone **1000** subject to a perturbation **1100**, whereby rods **1010**, **1020**, and **1030** are bend due to perturbation **1100**.

FIG. 12 shows an example of a marker device assembly **1200** with a base **1210**, a spiral **1220**, a cover **1230** and a ring **1240** using a cross sectional view of marker device assembly **1200**. Ring **1240** is used as a sort of quick-connector to assemble the modular components (i.e. base **1210**, spiral **1220** and cover **1230**) of the marker device. Note that for clarity purposes in the inset figure, only part of the bottom ring of spiral **1220** is shown and spiral **1220** should in fact extend upward as shown by **1200**. The key idea of ring **1240** is to position spiral **1220** and cover **1230** against the inner edge **1215** of base **1210**. Ring **1240** could be made out of any type of material (e.g. a plastic, rubber or polyester) as long as it has enough strength to hold together base **1210**, spiral **1220** and cover **1230** as well as enough flexibility to assemble (de-assemble) these three parts together (apart).

FIG. 13 shows an example of how base **1310** and flexible means could be connected in case the flexible means includes one or more rods **1320** and **1330** each with a fast impulse

response to direct and indirect perturbations. For example, rod **1320** includes an end part **1322** that could be positioned more or less parallel to the bottom **1315** of base **1310**. Rod **1320** could include a spring **1324** as an integral part of rod **1320** to ensure the necessary flexibility of the flexible means. However, the question whether spring **1324** is necessary depends on the physical characteristics (e.g. flexibility) of rod **1320**.

The present invention is also not limited to a marker device with one flexible means since it could also include two or more flexible means each with a fast impulse response to direct and indirect perturbations. This includes the need to allow for large deflections of one or more parts of each of the flexible means as described *supra*. **FIG. 14** shows an exemplary embodiment of a marker device **1400** in the form of a barricade that includes two or more flexible means **1420** and **1430** that are positioned over base **1410**. In case of a barricade, base **1410** typically has a rectangular shape. Base **1410** could have opening that could be advantageous for stacking purpose, however, this is not necessary. The two or more flexible means **1420** and **1430** could be positioned to base **1410** is a similar manner as discussed *supra* for a single flexible means. Marker device **1400** could also include: (1) a cover **1440** that covers the two or more flexible means, (2) one or more shapes and/or reflective materials **1450** and **1452**, and/or (3) one or more light sources placed on the outside (e.g. **1460** and **1462**) of cover **1440** or at the inside of cover **1440** (not shown in **FIG. 14**, but discussed *supra*). It should be clear to a person of average skill in the art that the teachings for a marker device with one flexible means, as discussed *supra*, also apply to a marker device with two or more flexible means. Furthermore, it should be clear to a person of average skill in the art

that a marker with two or more flexible means is not limited to a barricade, since such a marker device could also be a fence-like structure as long as all these variations include the advantages and objective as stated and discussed *supra* in terms of safety, flexibility when subject to direct or indirect perturbations. A fence-like marker device according to the present invention could be small but also significantly wide, for instance to fence-off a yard, a street part etc. Imagine that a car runs into such a wide fence, then the part of the fence where the car runs into flexes, bends etc. according to the teaching *supra* and restores to its natural original position when the car (read perturbation) has disappeared.

All such variations are considered to be within the scope and spirit of the present invention as defined by the following claims and their legal equivalents.